

15.1 ASTHMA

AEROMEDICAL CONCERNS: Asthma symptoms can rapidly progress from minimal to totally disabling. Exposure to smoke or fumes can provoke an attack in susceptible individuals. Positive pressure breathing, breathing of dry air, and +Gz exposure can stimulate bronchospasm in individuals with hyper-reactive airways. 70% of asthmatics also suffer from recurrent sinusitis.

WAIVER: A history of asthma is CD for military service and for aviation training, even if very mild. Waivers for aviation **applicants** can be recommended if the individual has been asymptomatic for a minimum of five years, the primary physician or specialty consultant documents an otherwise normal history and physical examination, and baseline PFT's are normal with post bronchodilator (<15% change in FEV1) and Methacholine/Provocative testing is negative.

Designated aviation personnel with mild intermittent or persistent asthma are considered NPQ. A waiver can be recommended on a case-by-case basis if the member's asthma is controlled/stable only on cromolyn sodium, Tilade, or a leukotriene inhibitor. Generally consideration will be given for non-high performance aircraft only. Methacholine challenge testing is indicated in those individuals with a questionable history of wheezing. Early response to low doses (less than 10 mg/ml) is considered aeromedically significant. Methacholine challenge testing is not indicated in those individuals with an unquestionable history of asthma, as it can precipitate status asthmaticus. If a waiver is granted, the use of a short acting Beta-agonist is allowed on an as needed basis (rescue medication). If needed, temporary grounding is recommended with close flight surgeon follow-up.

INFORMATION REQUIRED:

1. Internal medicine or pulmonology consult
2. Complete pulmonary function testing (PFT)
 - a. Baseline
 - b. Post bronchodilator
 - c. Methacholine/provocative testing
 - d. Abnormal PFTs must document effect of a post-PFT bronchodilator

NOTE: Once a member's asthma is controlled on a stable dose of cromolyn sodium, Tilade, or a leukotriene inhibitor, a repeat PFT is required if the waiver request includes the use of a new medication.

FOLLOWUP: If anything other than routine submission is required, the submission should be accompanied by results of recent PFT. For all submissions, the medications that the individual requires for control of symptoms must be listed on the SF-88, along with their frequency of use.

TREATMENT: Patients may be controlled by cromolyn sodium, Tilade, or a leukotriene inhibitor. The use of beta agonists is CD, with waiver only recommended as above for rescue use only! Grounding is required during exacerbations of mild intermittent or persistent asthma.

DISCUSSION: Reliable diagnosis depends on a substantiated history of cough, wheeze, or dyspnea lasting more than 6 months, along with an increase in FEV1 >15% after administration of an inhaled bronchodilator, airway hyper-reactivity demonstrated by an exaggerated decrease in airflow induced by a standard bronchoprovocation challenge such as methacholine inhalation, or demonstration of exercise-induced bronchospasm.

We make an artificial distinction between individuals who have these symptoms only in the presence of acute upper respiratory infections. These persons do not have the chronic course necessary for the diagnosis of asthma, but may meet the criteria for diagnosis of asthma if symptoms persist.

If diurnal peak expiratory flow rate variability is >15%, the condition can be regarded as more than mild in nature. Attacks can be exacerbated by breathing cold and dry air, by respiratory infections, and by exercise. The first 2 factors may contribute to nocturnal asthma, the effects of which are exacerbated by sleep apnea. Of childhood asthmatics, 50-55% will achieve prolonged remission, but more than half will eventually relapse. The mean age of recurrence is 32.5 years, compared to nearly 50 years for those patients who develop asthma as an adult. Reasons for permanent disqualification from flying include persistent, marked bronchial hyper-reactivity, frequent episodes of asthma, and inadequate control with drugs. The Air Force reports that 25% of the medical evacuations from Desert Storm were for asthma. Mild asthmatics can remain symptom-free for long periods and then suddenly have a severe exacerbation of the condition when exposed to a trigger.

ICD-9 CODES:

493.0 Extrinsic Asthma

493.1 Intrinsic Asthma

493.9 Asthma, Unspecified (use for Exercise Induced Asthma)

15.2 CHRONIC OBSTRUCTIVE PULMONARY DISEASE

AEROMEDICAL CONCERNS: Chronic obstructive pulmonary disease (COPD) results in a reduction in maximum oxygen uptake and exercise tolerance. Cerebral hypoxia can adversely affect psychomotor skills, memory, judgment and cognition. Decrements in judgment and the ability to perform complex tasks are also caused by carbon dioxide retention that can occur in COPD. Sudden incapacitation as a result of pneumothorax can occur if a bulla ruptures.

WAIVER: Waivers may be considered for designated aviators only on a case-by-case basis if there is no cardiovascular decompensation, exercise tolerance is unimpaired, the patient does not require any medications, and there are no bullae evident on radiographs. Pulmonary function testing should be normal. Aviation personnel meeting these criteria will be restricted from high-performance aircraft.

INFORMATION REQUIRED:

1. Internal medicine or pulmonology consultation
2. Chest x-ray and/or CT to exclude bullae
3. Complete PFT including bronchodilator challenge
4. Cardiology consultation (if there is evidence of RVH)

NOTE: Severe COPD should be referred to a medical board. The use of steroid inhalers either alone or in concert with beta agonists or cholinergic antagonists is CD, with no waiver recommended.

TREATMENT: Treatment of reversible airway obstruction by immunotherapy or cromolyn sodium is CD. Annual influenza immunization, pneumovax, and treatment aimed at smoking cessation and weight loss (if overweight) are encouraged.

DISCUSSION: The lower limit of oxygenation needed to permit adequate cerebral oxygenation is a $\text{PaO}_2 > 65$ mm Hg at sea level. The corresponding lower limits for successive 1000 ft increments to 8000 ft are 61, 58, 55, 52, 50, 48, 46 and 45 mm Hg. Obesity or tight fitting clothing can reduce lung volumes leading to hypoventilation and ventilation/perfusion imbalance. Patients with COPD are also at increased risk of acute chest infections, further complicating care in the operational setting. Symptoms will be expected when the forced expiratory volume at 1 second (FEV1) reaches 50% of that predicted by sex and age. While the normal FEV1 declines at about 30 ml/year, the reduction in smokers can reach 90 ml/year. Of all patients, up to 50% will have persistent, productive cough, up to 25% will be moderately disabled with recurrent chest infections and increasing absences from work, and up to 25% will be severely disabled within 10 years.

ICD-9 CODE:

496 Chronic Obstructive Pulmonary Disease

15.3 PNEUMOTHORAX

AEROMEDICAL CONCERNS: Acute pneumothorax may cause acute chest pain and dyspnea during flight, worsening as ambient pressure falls. Tension pneumothorax is a life threatening condition that, although rare, will cause hypoxia arising from ventilation/perfusion imbalance and cardiovascular compromise.

WAIVER:

Traumatic Pneumothorax: Traumatic or surgical pneumothorax is NCD when the injury has healed and the aircrew is determined fit for full duty by the pulmonologist or surgeon.

Spontaneous Pneumothorax: Primary spontaneous pneumothorax is CD, however a waiver can be considered based upon the below guidelines. Subsequent occurrence of spontaneous pneumothorax is CD, with no waiver recommended unless surgical or chemical pleurodesis has been performed

Applicants:

- **Single episode of spontaneous pneumothorax:** The applicant may be considered for waiver of standards one year after the resolution of the pneumothorax if treated solely with chest tube reinflation. High resolution CT scan must prove no pathology (blebs or underlying parenchymal disease) and pulmonary function tests must be within normal limits. If treated surgically or chemically, six months must elapse post pneumothorax before a waiver can be considered, provided the above studies are normal. All applicants must first be waived by commissioning authority before aviation waiver can be considered. Altitude chamber runs are not required for disposition and/or waiver recommendation.
- **Recurrent spontaneous pneumothorax:** Permanently disqualifying, with no waivers recommended unless chemical or surgical pleurodesis has been performed with resultant normal high-resolution chest CT scan and Pulmonary Function Test (PFT).

Designated:

- **Single episode of spontaneous pneumothorax:** The aviator may be returned to flying status after three months. Submission of the following must accompany waiver requests. Designated personnel who undergo chemical or surgical pleurodesis may also be returned to flying status after three months. Altitude chamber runs are not required for disposition and/or waiver recommendation.
- **Recurrent spontaneous pneumothorax:** CD, waiver not recommended. Waivers may be considered only after definitive treatment (chemical or surgical pleurodesis) to prevent recurrence. Designated personnel who undergo chemical or surgical pleurodesis may be returned to flying status after three months

INFORMATION REQUIRED:

1. Thin cut, high-resolution chest CT scan demonstrating full lung expansion and no pathology that could predispose to recurrence
2. Normal Pulmonary Function Test results
3. Thoracic surgery consultation (in recurrent cases, or in cases with structural abnormalities)

FOLLOW-UP: None required.

TREATMENT: All recognized forms of treatment (chemical or surgical pleurodesis) are acceptable for waiver consideration. Recurrence rate after chemical pleurodesis is higher than after thoracotomy and pleural abrasion.

DISCUSSION: Over 90% of patients presenting with spontaneous pneumothorax are under 40 years old, with 75% being younger than 25. In women, there is often a relationship to menstruation. Onset of spontaneous pneumothorax is accompanied by chest pain in 90% of cases and by dyspnea in 89%. Tension pneumothorax develops in 5% and hemopneumothorax in 2.5%. Recurrence rates in patients who have not had definitive treatment have been reported to be from 28% for PSP and 43% for SSP. In one series of patients followed for 10 years without surgery, ipsilateral recurrence followed in 50% of the patients, with 62% happening in the first 2 years. A study published in JAMA 1990 found that most recurrences occur within the first six months. Another study reported a recurrence rate of 30% after a first spontaneous pneumothorax, 50% after a second episode, and 80% after a third. The contralateral risk was reported as 5.2% to 14.6%. Recurrence depends on the procedure used for treatment. Thoracoscopic pleurodesis has recurrence rates less than 7% while chemical pleurodesis has been reported to have a recurrence rate of 9% to 12% depending on the agent used. Thoracotomy with pleural abrasion has rates ranging from 1 to 3.6%. The Air Force has reviewed patients exposed to chamber flight before return to flying duties. Their analysis revealed that no episodes were eliminated and there was no value in predicting later recurrence. Of note, they required a much longer grounding period before testing, so their data may not be directly comparable to our requirements.

ICD-9 CODES:

512.8 Pneumothorax

860 Any Traumatic or Iatrogenic pneumothorax

15.4 SARCOIDOSIS

AEROMEDICAL CONCERNS: The protean manifestations of sarcoidosis can involve almost any organ system. Cardiac sarcoidosis, while uncommon, is associated with a restrictive cardiomyopathy and sudden death from arrhythmias. Patients with pulmonary infiltration may have symptoms of restrictive lung disease, which may be distracting in flight. Uveitis can cause permanent visual damage. Nervous system involvement can also occur. Hypercalcemia can predispose the aircrew member to renal stones.

WAIVER:

Applicants: CD, waiver not recommended.

Designated personnel: CD, waiver not recommended for at least 2 years of remaining asymptomatic off medications.

INFORMATION REQUIRED:

1. Pulmonary, Internal Medicine, or Family Practice consult
2. Ophthalmology consult
3. Pulmonary function tests
 - a. Spirometry
 - b. Lung volume
 - c. Diffusion
 - d. Exercise PFT
4. Serum calcium
5. 24hr urine calcium
6. Thallium stress testing
7. ECG
8. Echocardiogram

FOLLOW-UP: Annual submission to include:

1. Chest X-ray
2. PFT's
3. ECG
4. Serum calcium

DISCUSSION: The incidence is highest in the 20-35 age group. Up to 50% present with abnormal radiographic findings (usually bilateral enlargement of hilar nodes) or nonspecific respiratory symptoms. Between 10 and 50% will have erythema nodosum, which is more commonly seen in females. Uveitis can be seen in 15 to 25% of patients, and superficial node enlargement is seen in about 30% of Europeans with sarcoidosis and up to 80% of African Americans. The spleen is palpable in 10 to 25% of patients, with massive splenomegaly present in 3%. Up to 30% of cases with acute sarcoidosis will have abnormal thallium scans suggesting

myocardial involvement. Liver biopsy will show sarcoid granulomas in 70% of cases without evidence of altered liver function. Nervous system involvement is demonstrable in 10% but may be subclinical in a greater percentage. Osteolytic or osteosclerotic bone lesions are also present in 10% of cases. Most cases (80%) with hilar adenopathy resolve spontaneously within 2 years, but there is a 5-10% chance of developing progressive pulmonary fibrosis and a 6-7% eventual mortality in those with radiologically evident pulmonary sarcoidosis. The presence of ocular involvement or chronic tonsillitis has been reported to be associated with a poorer prognosis. High levels of serum interferon-gamma (IFNg) before treatment are associated with a more favorable prognosis. Healed myocardial granulomas may lead to arrhythmias, and patients in remission who have had myocardial involvement remain at risk for sudden death. MRI scan may eventually prove to be the method of choice for identifying cardiac sarcoid granulomas.

ICD-9 CODE:

135 Sarcoidosis